Buckinghamshire Water Cycle Study Stage 1- Addendum

Final

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This report describes work commissioned by Buckinghamshire Council, by an instruction dated 05 September 2024. The Client's representative for the contract was Aude Pantel of Buckinghamshire Council. Jessica Creber and James Fitton of JBA Consulting carried out this work.

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Abbreviations

AMP	Asset Management Plan
AW	Anglian Water
BOD	Biological Oxygen Demand
CIRIA	Company providing research and training in the construction industry
EA	Environment Agency
STW	Sewage Treatment Works
TW	Thames Water
WFD	Water Framework Directive
WRMP	Water Resources Management Plan

1 Introduction

1.1 Reason for addendum

JBA Consulting was commissioned by the Buckinghamshire Council to undertake an addendum to the Stage 1 Water Cycle Study (WCS) completed in 2024. The original Stage 1 study used a housing need calculated using the Standard Method which was correct at the time of writing. Proposed changes to the National Planning Policy Framework (NPPF) may result in a large increase in the housing need. The purpose of this addendum is to revisit the assessments undertaken in the original Stage 1 study in the light of the increased housing need.

1.2 Requirement for update

In the original Stage 1 WCS, the housing need was used in two places: a comparison between the Buckinghamshire housing need and the Water Resource Management Plans (WRMP) and in the water quality sensitivity analysis.

These two assessments will be repeated in this addendum. All the other assessments in the original Stage 1 WCS remain valid. Only pertinent information from the original study has been reproduced in the addendum to put the assessment in context. For both assessments, the addendum should be read alongside the original work.

1.3 Updated housing need

Buckinghamshire Council provided an updated housing need for the Local Plan period (2024 to 2045). Water company data used in the Stage 1 study covered a period up to 2022. Further data in form of completions for 2022 and 2023 were therefore required to ensure that recent growth as well as planned growth was considered. This gave an estimated increase in the number of houses between 2022 and 2045 of 91,711 dwellings. This is a significant increase on the equivalent figure used in the original Stage 1 WCS (64,120 dwellings).

2 Water Resources

2.1.1 Introduction

When new development within a Local Planning Authority is being planned, it is important to ensure that there are sufficient water resources in the area to cover the increase in demand without risk of shortages in the future or during periods of high demand, and without causing a negative impact on the waterbodies from which water is abstracted.

The aim of the initial assessment was to compare the future additional demand as a result of development proposed within the emerging Local Plan, with the demand accounted for by Thames Water, Anglian Water and Affinity Water within their Water Resource Management Plans.

The original stage 1 assessment used the Water Resources Market Information tables published as part of each water company's WRMP19. Thames Water (TW), Anglian Water (AW) and Affinity Water (AfW) have recently published their Final WRMP24 and so the WRMP24 data tables have been used in the addendum report.

The Office for National Statistics Household Projections 2018 dataset was used to provide a baseline for the number of houses in Buckinghamshire in 2022. This is unchanged from the original Stage 1. The ONS Household projection ends in 2043 and this figure was used in stage 1 to represent the number of households in 2045. The addendum extrapolates from 2043 to 2045 using the rate of change between 2042 and 2043 to provide a more representative figure for 2045.

2.1.2 Population and household growth

Table 2.1 shows the household growth forecasts for the Water Resource Zones (WRZs) which serve growth within Buckinghamshire from the ONS 2018 Household Projection, the emerging Local Plan and the WRMP24s.

The ONS projection predicts an increase in the number of households between 2022 and 2045 of 12% (a minor difference from the original Stage 1 due to the extrapolation from 2043). This is significantly less than the forecast increase in the number of houses if the housing need were delivered. This was 29% in the Stage 1 study and has increased to 42% in response to the increased housing need.

The addendum has used the latest information available from the water companies Final WRMP24 data tables. This has resulted in changes to the estimated increase in households from the Stage 1 assessment.

For the two TW Water Resource Zones (WRZs): Swindon and Oxfordshire (SWOX) and Slough, Wycombe, Aylesbury (SWA) the baseline number of houses is considerably lower in the WMRP24 compared with WRMP19. This may be because growth expected to be delivered by 2022 did not happen. The number of houses expected by 2045 in SWA is also considerably lower in WRMP24 than WRMP19.

The result is an increase in the percentage growth expected for SWOX WRZ and a decrease for Aylesbury, Slough, Wycombe WRZ. In both cases this is less than the percentage growth predicted based on the new housing need.

In the two Anglian Water WRZs: Ruthamford Central and Ruthamford West, the 2022 baseline is similar between WRMP19 and WRMP24. However, the 2045 forecast is lower for Ruthamford West resulting in a decrease in their percentage growth forecast (26% to 17%) and is higher for Ruthamford Central resulting in an increase in their percentage growth forecast (from 28% to 45%). The percentage growth in Ruthamford Central is therefore slightly higher than that forecast for Buckinghamshire.

In the two Affinity Water area there are two WRZs: Misbourne WRZ and Pinn WRZ. For Pinn WRZ, 2022 baseline is similar between WRMP19 and WRMP24 but there is a considerable increase in the number of houses forecast, resulting in an increase in the forecast percentage growth from 25% to 54% - higher than the expected Buckinghamshire growth percentage. For Misbourne WRZ, there is also an increase in the percentage growth predicted resulting (from 12% to 27%) resulting from both a reduced 2022 baseline and an increased 2045 forecast.

It is difficult to make direct comparisons between growth forecasts in Buckinghamshire and the WRZs due to their differing geographies. In SWOX, SWA, Ruthamford West, and Misbourne WRZs the percentage growth is less than that predicted if the new Buckinghamshire housing need were delivered by 2045. In Ruthamford Central and Pinn WRZs, the percentage growth is higher.

It is recommended that the differences between the Buckinghamshire housing need and the WRMP24 forecasts are explored further in the Stage 2 WCS and assurances sought from TW, AW and AfW that growth from Buckinghamshire can be accommodated alongside growth elsewhere in their WRZs.

Table 2.1 Comparison of household growth forecasts

Forecast	2022	Updated 2022 figures	Previous 2045 figures	2045	Previous increase	increase
ONS Household Projection (2018) – Buckinghamshire	219,780	N/a	243,556	245,366	11%	12%
Indicative growth in Local Plan	219,780	N/a	284,056	311,491	29%	42%
WRMP24 – SWOX (Updated October 2024) *	500,750	455,470	611,240	610,640	22%	34%
WRMP24 – Slough, Wycombe, Aylesbury ((Updated October 2024 2024)*	253,240	221,680	338,310	267,330	34%	21%
WRMP24 – Ruthamford West (Updated Sept 2024) **	39,770	39,140	48,330	45,620	26%	17%
WRMP24 – Ruthamford Central (Updated Sept 2024) **	136,170	133,710	178,640	193,540	28%	45%
WRMP24 Forecast – Misbourne (Updated October 2024)***	145,760	139,440	162,920	176,660	12%	27%

Forecast	2022	Updated 2022 figures	Previous 2045 figures	2045	Previous increase	increase
WRMP24 Forecast – Pinn (Updated October 2024)***	382,320	386,370	479,730	593,190	25%	54%

*These figures are based on Thames Waters Final WRMP24 data tables: Water resources | Regulation | About us | Thames Water
** These figures are based on Anglian Waters Final WRMP24. The data tables can be accessed here: Water resources management plan (anglianwater.co.uk)
*** These figures are based on the Final WRMP24 data tables: Water Resources Management Plan | Affinity Water Have your say (engagementhq.com)

2.2 Conclusion

The new housing need is considerably higher than was taken into account in the original Stage 1 work and is higher than the percentage growth forecast in four of the six WRZs serving Buckinghamshire. This needs to be investigated further in a Stage 2 WCS and assurances sought from the water companies that the housing need can be accommodated alongside other planned growth in their WRZs.

The Final WRMPs have only just been published at the time of writing and while the latest data has been used, a full review of these documents has not been conducted. This should be done as part of the Stage 2 WCS.

2.3 Recommendation

The recommendations from the Stage 1 study are unchanged apart from the addition of a recommendation to investigate the differences between the LPA and WRMP24 housing forecasts to ensure sufficient water resources are available to serve growth during the Local Plan period.

Table 2.2 Updated Recommendations for Water Resources

Action	Responsibility	Timescale
Continue to regularly review forecast and actual household growth across the supply region through WRMP Annual Update reports, and where significant change is predicted, engage with Local Planning Authorities.	Thames Water, Anglian Water, Affinity Water	Ongoing
Provide yearly updates of projected housing growth to water companies to inform WRMP updates.	Buckinghamshire Council	Ongoing
The council should consider a domestic water efficiency target of 100l/p/d for all new homes, and work with water suppliers to incentivise even lower consumption. This should be achieved using a fittings based approach. This should be supported by an equivalent non-household water efficiency target.	Buckinghamshire Council	In Buckinghamshire LP

Action	Responsibility	Timescale
The concept of water neutrality has the potential to provide a benefit in improving resilience to climate change and enabling all waterbodies to be brought up to Good status. Explore further with the water companies and the Environment Agency how the Council's planning and climate change policies can encourage this approach. This approach could have particular application in strategic sites and new settlements.	Buckinghamshire Council, Environment Agency, Thames Water, Anglian Water, Affinity Water	In Buckinghamshire LP
Larger residential developments (including strategic urban extensions and as planned for new settlements), and commercial developments should consider incorporating greywater recycling and/or rainwater harvesting into development at the master planning stage in order to reduce water demand.	Buckinghamshire Council, Thames Water, Anglian Water, Affinity Water	In Buckinghamshire LP
Water companies should advise Buckinghamshire Council of any strategic water resource infrastructure developments within the study, where these may require safeguarding of land to prevent other type of development occurring.	Buckinghamshire Council, Thames Water, Anglian Water, Affinity Water	Part of Buckinghamshire LP process
Review this section of the WCS following publication of the Water Resource Management Plans for 2024.	Buckinghamshire Council, Thames Water, Anglian Water, Affinity Water	Stage 2 WCS
Investigate the difference between the updated housing need and the housing forecasts contained in the Final WRMP24	Buckinghamshire Council, Thames Water, Anglian Water, Affinity Water	Stage 2 WCS

3 Water Quality

3.1 Introduction

Increase in the discharge of effluent from Wastewater Treatment Works (WwTW) as a result of development and growth in the area in which they serve can lead to a negative impact on the quality of the receiving watercourse. Under the Water Framework Directive (WFD), a watercourse is not allowed to deteriorate from its current WFD classification (either as an overall watercourse or for individual elements assessed).

3.2 Water quality sensitivity assessment

In the original Stage 1 study the housing need of 64,120 was factored into the water quality model to provide a percentage increase in effluent flow at every WwTW across the model.

SIMCAT is used by the Environment Agency to model water bodies and identify where permit changes are needed to prevent deterioration or improve water quality as well as supporting decision making to guide development to locations where environmental deterioration will be reduced. SIMCAT is a 1-Dimensional model which represents inputs from both point-source effluent discharges (i.e. the point at which the WwTW discharges into the watercourse) and diffuse sources (i.e. further along within the watercourse where the discharge is more diluted), and the behaviour of solutes in the river.

The study area is covered by the Thames and Wash SIMCAT models.

Within SIMCAT, the determinands modelled were Biochemical Oxygen Demand (BOD), Ammonia (NH_4) and Phosphorus (P). In fresh waterbodies, phosphate is usually the limiting nutrient for algal growth.

The following methodology was used:

- Run SIMCAT with current flow data and extract water quality outputs for ammonia, biochemical oxygen demand (BOD) and phosphate.
- Increase effluent flows at WwTWs by a range of percentages to account for potential future development. (Note that in this case, the percentage is the increase in effluent flow - not the increase in the number of houses)
- Re-run SIMCAT with higher effluent flows and extract relevant river water quality data.
- Compare the two model runs for all three water quality indicators and categorise the percentage change.

In the original Stage 1 study the housing need of 64,120 was factored into the water quality model to provide a percentage increase in effluent flow at every WwTW across the model.

Potential future development within Buckinghamshire has been re-calculated using an Local Housing Need (LHN) figure of 91,711 homes over the period from 2022 to 2045 provided by Buckinghamshire Council. Using average consumption and occupancy rates across Buckinghamshire (shown in Table 7.1 of the Stage 1 WCS), the LHN has been converted into a wastewater demand and compared against the total flow at WwTWs in Buckinghamshire to calculate the planned growth as a percentage of WwTW flow.

Two additional growth scenarios have been modelled whereby a 15% buffer has been applied above and below the proposed growth to represent increased and decreased growth respectively. The potential future growth has been calculated as a 31% increase in flow, with the potential upper end growth calculated at 36%, and potential lower end growth at 21%. These percentages have been used to upscale all WwTWs in the Thames and Wash models.

Where water quality downstream of a WwTW in any given determinant deteriorates by 10% or more in response to a 31% increase in effluent flow, the sewer catchment can be said to be “more sensitive” to changes in effluent flow, and therefore growth. It should be noted that this assessment takes the existing SIMCAT model based on 2014-2020 data and increases flow by a consistent figure across the whole model. In some cases, a WwTW may be able to accommodate a higher flow, in other cases, a 31% increase may not be likely or feasible. This assessment therefore just highlights the relative risk of deterioration.

This analysis also does not take into account planned changes in permits at WwTWs beyond 2025 that would have the effect of improving water quality. The modelling in the Stage 2 WCS will identify where changes to permit limits may be required in order to accommodate growth.

3.3 Results

The sensitivity analysis was conducted using the EA's SIMCAT models and the full results are shown in Appendix A. The modelling results suggest changes in the volume of treated wastewater in Buckinghamshire cause a significant increase in the concentrations of ammonia, BOD, and phosphate within Buckinghamshire.

Similar trends are observed in the upper and lower growth scenario results, with deteriorations in ammonia, BOD, and phosphate predicted at a number of treatment works.

High Wycombe WwTW was closed in the early 2000s. A proportion of effluent treated at Little Marlow is pumped to High Wycombe where it is discharged to the River Wye to compensate for the flow previously discharged from the now closed High Wycombe WwTW. The remainder of the final effluent from Little Marlow discharges to the River Thames. In both the main Stage 1 and the addendum sensitivity analysis, flow at both Little Marlow WwTW and the discharge at High Wycombe present in the SIMCAT model have been increased. In the stage 2 detailed water quality modelling the relationship between Little Marlow WwTW and the discharge at High Wycombe will be investigated further.

3.3.1 Local Housing Need (LHN) growth scenario

During the middle growth scenario (31% increase in WwTW flows), 32 WwTWs are shown to deteriorate by greater than 10% for ammonia, 10 WwTW for BOD, and 22 WwTWs for phosphate.

Significant deterioration (>10%)

In the middle growth scenario several sites are predicted to change WFD class. Within the ammonia assessment, five WwTWs were predicted to change WFD class, these are:

- Ludgershall STW
- Shabbington STW
- Stone STW
- Winslow STW
- Brackley STW (New)

Within the BOD assessment, five WwTWs were predicted to change WFD class, these included:

- Grendon Underwood STW
- Princes Risborough STW
- Stone STW
- Wingrave STW
- Stewkley STW

The Phosphate assessment indicates that four WwTWs were predicted to change WFD class, nominally Great Horwood, Stowe, Ivinghoe and Ivinghoe Aston WwTWs.

Table 3.1: WwTWs with a significant deterioration (>10%)

Catchment	WwTW	Ammonia Deterioration	BOD Deterioration	Phosphate Deterioration
Thames	Chilton STW	12%	6%	11%
Thames	Cuddington STW	N/a	11%	N/a
Thames	Gerrards Cross STW	17%	12%	15%
Thames	Grendon Underwood STW	N/a	14%	15%
Thames	Haddenham STW	14%	13%	N/a
Thames	High Wycombe - transfer from Little Marlow	15%	N/a	N/a
Thames	Hurley STW	13%	N/a	10%
Thames	Iver (North) STW	N/a	10%	8%
Thames	Long Crendon STW	11%	N/a	N/a
Thames	Ludgershall STW	10%	10%	11%
Thames	Shabbington STW	18%	13%	18%
Thames	Stewkley STW	17%	14%	13%
Thames	Stone STW	22%	19%	N/a
Thames	Wingrave STW	N/a	12%	N/a
Wash	BRACKLEY STW (NEW)	20%	N/a	12%
Wash	BUCKINGHAM(MAIDS MOR	21%	N/a	16%
Wash	CHACKMORE STW	22%	N/a	14%
Wash	CUBLINGTON (WING) ST	14%	N/a	11%
Wash	DRAYTON PARSLOW STW	25%	N/a	10%
Wash	GREAT BRICKHILL STW	17%	N/a	11%
Wash	GREAT HORWOOD	22%	N/a	N/a
Wash	HILLESDEN (HAMLET) STW	19%	N/a	27%
Wash	Hillesden Church End	20%	N/a	27%

Catchment	WwTW	Ammonia Deterioration	BOD Deterioration	Phosphate Deterioration
Wash	HORTON STW	14%	N/a	11%
Wash	Ivinghoe Aston	19%	N/a	14%
Wash	IVINGHOE STW	13%	N/a	13%
Wash	LECKHAMSTEAD STW	19%	N/a	N/a
Wash	MIDDLE CLAYDON STW	26%	N/a	14%
Wash	NORTH MARSTON STW	27%	N/a	N/a
Wash	OVING STW	26%	N/a	N/a
Wash	PADBURY STW	23%	N/a	N/a
Wash	POUNDON STW	21%	N/a	27%
Wash	STEEPLE CLAYDON STW	26%	N/a	21%
Wash	STOWE STW	N/a	N/a	23%
Wash	SWANBOURNE STW	21%	N/a	16%
Wash	TWYFORD STW	19%	N/a	27%
Wash	WINSLOW STW	18%	N/a	N/a

'Bad' status with >3% deterioration

Table 3.2: WwTWs discharging to watercourse at 'Bad' status with >3% deterioration

Catchment	WwTW	Ammonia Deterioration	BOD Deterioration	Phosphate Deterioration
Thames	Chilton STW	N/a	N/a	11%
Thames	Grendon Underwood STW	N/a	N/a	15%
Thames	Haddenham STW	N/a	N/a	6%
Thames	Ludgershall STW	N/a	N/a	11%
Thames	Marsh Gibbon STW	3%	4%	N/a
Thames	Shabbington STW	N/a	N/a	18%
Thames	Stewkley STW	N/a	N/a	13%
Thames	Stone STW	N/a	N/a	7%
Wash	PADBURY STW	N/a	N/a	5%
Wash	WINSLOW STW	N/a	N/a	4%

3.3.2 LHN minus 15% Growth scenario

During the lower growth scenario (27% increase in WwTW flows), 31 WwTWs are shown to deteriorate by greater than 10% for ammonia, 8 WwTWs for BOD, and 22 WwTWs for phosphate.

Significant deterioration (>10%)

During the lower growth scenario several sites have had a change of class. Ludgershall, Stone, Winslow and Brackley WwTWs have all had a change of class within the assessment for ammonia. For BOD, Princes Risborough, Stone, Wingrave and Stewkley WwTWs have also had a change in class. For the assessment of phosphate, four WwTWs also changed class. Nominally Twyford, Stowe, Ivinghoe and Ivinghoe Aston.

Table 3.3: WwTWs with a significant deterioration (>10%)

Catchment	WwTW	Ammonia Deterioration	BOD Deterioration	Phosphate Deterioration
Thames	Chilton STW	12%	N/a	10%
Thames	Cuddington STW	N/a	10%	N/a
Thames	Gerrards Cross STW	15%	11%	13%
Thames	Grendon Underwood STW	N/a	12%	14%
Thames	Haddenham STW	12%	11%	N/a
Thames	High Wycombe - transfer from Little Marlow	13%	N/a	N/a
Thames	Hurley STW	11%	N/a	N/a
Thames	Long Crendon STW	10%	N/a	N/a
Thames	Ludgershall STW	N/a	N/a	10%
Thames	Shabbington STW	17%	12%	16%
Thames	Stewkley STW	15%	12%	11%
Thames	Stone STW	19%	17%	N/a
Thames	Wingrave STW	N/a	11%	N/a
Wash	BRACKLEY STW (NEW)	18%	N/a	10%
Wash	BUCKINGHAM(MA IDS MOR	19%	N/a	14%
Wash	CHACKMORE STW	19%	N/a	13%
Wash	CUBLINGTON (WING) ST	12%	N/a	10%

Catchment	WwTW	Ammonia Deterioration	BOD Deterioration	Phosphate Deterioration
Wash	DRAYTON PARSLOW STW	22%	N/a	N/a
Wash	GREAT BRICKHILL STW	16%	N/a	10%
Wash	GREAT HORWOOD	19%	N/a	N/a
Wash	HILLESDEN (HAMLET) STW	16%	N/a	24%
Wash	Hillesden Church End	17%	N/a	24%
Wash	HORTON STW	12%	N/a	10%
Wash	Ivinghoe Aston	17%	N/a	12%
Wash	IVINGHOE STW	12%	N/a	12%
Wash	LECKHAMSTEAD STW	15%	N/a	N/a
Wash	MIDDLE CLAYDON STW	23%	N/a	13%
Wash	NORTH MARSTON STW	23%	N/a	N/a
Wash	OVING STW	22%	N/a	N/a
Wash	PADBURY STW	20%	N/a	N/a
Wash	POUNDON STW	18%	N/a	24%
Wash	STEEPLE CLAYDON STW	22%	N/a	18%
Wash	STOWE STW	N/a	N/a	20%
Wash	SWANBOURNE STW	18%	N/a	14%
Wash	TWYFORD STW	17%	N/a	24%
Wash	WINSLOW STW	16%	N/a	N/a

'Bad' status with >3% deterioration

Table 3.4: WwTWs discharging to watercourse at 'Bad' status with >3% deterioration

Catchment	WwTW	Ammonia Deterioration	BOD Deterioration	Phosphate Deterioration
Thames	Chilton STW	N/a	N/a	10%
Thames	Grendon Underwood STW	N/a	N/a	14%
Thames	Haddenham STW	N/a	N/a	6%
Thames	Ludgershall STW	N/a	N/a	10%

Catchment	WwTW	Ammonia Deterioration	BOD Deterioration	Phosphate Deterioration
Thames	Marsh Gibbon STW	3%	3%	N/a
Thames	Shabbington STW	N/a	N/a	16%
Thames	Stewkley STW	N/a	N/a	11%
Thames	Stone STW	N/a	N/a	6%
Wash	PADBURY STW	N/a	N/a	4%
Wash	WINSLOW STW	N/a	N/a	4%

3.3.3 LHN plus 15% Growth Scenario

During the higher growth scenarios (36% increase in WwTW flows), 36 WwTWs are shown to deteriorate by greater than 10% ammonia, 13 WwTWs for BOD, and 26 WwTWs for phosphate. Deteriorations in class are unchanged from the proposed growth scenario.

Significant deterioration (>10%)

Five WwTWs within the ammonia assessment showed a change of class, the WwTWs are:

- Ludgershall STW
- Shabbington STW
- Stone STW
- Winslow STW
- Brackley STW (New)

When assessing BOD, six WwTWs were found to have changed class, nominal:

- Ludgershall STW
- Grendon Underwood STW
- Princes Risborough STW
- Stone STW
- Wingrave STW
- Stewkley STW

Seven WwTWs showed a change of class when carrying out the assessment for phosphate, the WwTWs are:

- Poundon STW
- Twyford STW
- Hillesden Church End STW
- Great Horwood
- Stowe STW
- Ivinghoe STW
- Ivinghoe Aston

Table 3.5: WwTWs with a significant deterioration (>10%)

Catchment	WwTW	Ammonia Deterioration	BOD Deterioration	Phosphate Deterioration
Thames	Chilton STW	N/a	10%	N/a
Thames	Cuddington STW	16%	14%	N/a
Thames	Grendon Underwood STW	12%	11%	13%
Thames	Haddenham STW	14%	N/a	13%
Thames	High Wycombe - transfer from Little Marlow	18%	16%	15%
Thames	Hurley STW	10%	14%	N/a
Thames	Iver (North) STW	10%	13%	N/a
Thames	Long Crendon STW	N/a	10%	N/a
Thames	Shabbington STW	10%	17%	17%
Thames	Stewkley STW	25%	22%	N/a
Thames	Stone STW	20%	16%	20%
Thames	Wingrave STW	11%	N/a	11%
Wash	BRACKLEY STW (NEW)	26%	N/a	10%
Wash	BUCKINGHAM(MA IDS MOR	27%	N/a	N/a
Wash	CHACKMORE STW	25%	N/a	19%
Wash	CUBLINGTON (WING) ST	24%	N/a	19%
Wash	DRAYTON PARSLOW STW	27%	N/a	N/a
Wash	GREAT HORWOOD	25%	N/a	31%
Wash	HILLESDEN (HAMLET) STW	16%	10%	N/a
Wash	HORTON STW	25%	N/a	17%
Wash	Ivinghoe Aston	N/a	N/a	26%
Wash	IVINGHOE STW	23%	N/a	14%
Wash	LECKHAMSTEAD STW	22%	N/a	N/a
Wash	MIDDLE CLAYDON STW	N/a	11%	N/a

Catchment	WwTW	Ammonia Deterioration	BOD Deterioration	Phosphate Deterioration
Wash	NORTH MARSTON STW	23%	N/a	32%
Wash	OVING STW	23%	N/a	32%
Wash	PADBURY STW	30%	N/a	17%
Wash	POUNDON STW	12%	N/a	N/a
Wash	STEEPLE CLAYDON STW	21%	14%	17%
Wash	STOWE STW	31%	N/a	N/a
Wash	SWANBOURNE STW	21%	N/a	32%
Wash	TWYFORD STW	15%	N/a	11%
Wash	WINSLOW STW	30%	N/a	24%

'Bad' status with >3% deterioration

Table 3.6: WwTWs discharging to watercourse at 'Bad' status with >3% deterioration

Catchment	WwTW	Ammonia Deterioration	BOD Deterioration	Phosphate Deterioration
Thames	Chilton STW	N/a	N/a	13%
Thames	Grendon Underwood STW	N/a	N/a	17%
Thames	Haddenham STW	N/a	N/a	7%
Thames	Ludgershall STW	N/a	N/a	13%
Thames	Ludgershall STW	N/a	N/a	13%
Thames	Marsh Gibbon STW	4%	4%	N/a
Thames	Shabbington STW	N/a	N/a	20%
Thames	Stewkley STW	N/a	N/a	15%
Thames	Stone STW	N/a	N/a	8%
Wash	PADBURY STW	N/a	N/a	6%
Wash	WINSLOW STW	N/a	N/a	5%

3.4 Changes from original Stage 1 work

Model results from the previous assessment, based on a 21% increase in WwTW flows, show a deterioration for BOD in 3 river reaches, largely surrounding Aylesbury. With the updated LHN figures, a 31% increase in WwTW flows has been modelled and this could cause a deterioration in 10 river reaches. This deterioration

is still located within the centre of Buckinghamshire around Aylesbury, and within a river reach in the south-east near Gerrards Cross. Elsewhere, deterioration remains similar with a moderate (<10%) deterioration across the majority of Buckinghamshire. During the +/- 15% scenarios, there is an increase in the number of reaches deteriorating in quality for BOD, with 8 deteriorating in the lower growth scenario compared to 1 before, and 13 compared to 6 in the higher growth scenario.

For ammonia, the change in deterioration is generally similar between the older and newer modelling. Whilst the percentage deteriorations are higher in the newer modelling, the number of reaches downstream of a WwTW that will significantly deteriorate (>10%) remains similar. This is similar for all three of the modelled scenarios.

For phosphate, the number of reaches with a significant deterioration in quality is predicted to be nearly twice as many as shown in the previous modelling. Based on the LHN growth figure, 22 reaches are likely to significantly deteriorate compared to the 13 previously. The change in results mainly occurs in reaches close to the Buckinghamshire boundary on the north, east and west sides. During the +/- 15% scenarios, there is a significant increase in the number of reaches deteriorating in quality for BOD, with 22 deteriorating in the lower growth scenario compared to 8 before, and 26 compared to 18 in the higher growth scenario. Similarly to ammonia, there is little difference in the number of significant deteriorations between the three scenarios in the latest modelling for phosphate.

Whilst there are some similarities in the number of reaches that have either a significant or moderate deterioration between the old and new modelling for several scenarios, the percentage deteriorations are generally greater in the new modelling, and this increases the distance downstream of a WwTW that deterioration occurs for.

3.5 Conclusion

The EA "reasons for not achieving good" (RNAG) dataset indicates that the water industry (sewage discharges) and agriculture and rural land management (livestock and arable) are the main reasons for watercourses not achieving good status in this area. Growth during the local plan period will also increase the discharge of treated wastewater from WwTWs in Buckinghamshire. There is a potential for this to cause a deterioration in water quality in the receiving watercourses and this must be carefully considered.

A significant deterioration in water quality is not acceptable under the Water Framework Directive, and large-scale investment in treating effluent to higher standards may therefore be required.

The updated sensitivity analysis has shown that a larger number of water courses may be sensitive to the percentage increase in treated effluent that would result from delivering the Buckinghamshire housing need compared with the original Stage 1 work. However, the original conclusions and recommendations are still valid. The

sensitivity analysis suggests that watercourses within Buckinghamshire may be sensitive to increases in the discharge of treated wastewater. Further detailed water quality modelling should be undertaken in the Stage 2 WCS.

Within the main report, an additional water quality scenario was undertaken to model the scenario where the discharge at High Wycombe does not increase (the volume transferred from Little Marlow WwTW to be discharged into the Thames at High Wycombe remains the same). This has not been repeated for the addendum work, but it is believed that the findings would be similar. The nature of the relationship between Little Marlow WwTW and the discharge at High Wycombe will be investigated further in the detailed water quality modelling in the Stage 2 assessment.

3.6 Recommendations

Table 3.7 Recommendations for water quality

Action	Responsibility	Timescale
Provide annual monitoring reports to TW and AW detailing projected housing growth in the Local Authority	Buckinghamshire Council	Ongoing
When preferred options for growth are identified, undertake water quality impact modelling as part of a Stage 2 WCS.	Buckinghamshire Council	Ongoing
Take into account the full volume of growth (from Buckinghamshire and neighbouring authorities within the catchment when considering WINEP schemes or upgrades at WwTWs	Anglian Water and Thames Water	Ongoing

A Appendix

A.1 Water Quality Mapping

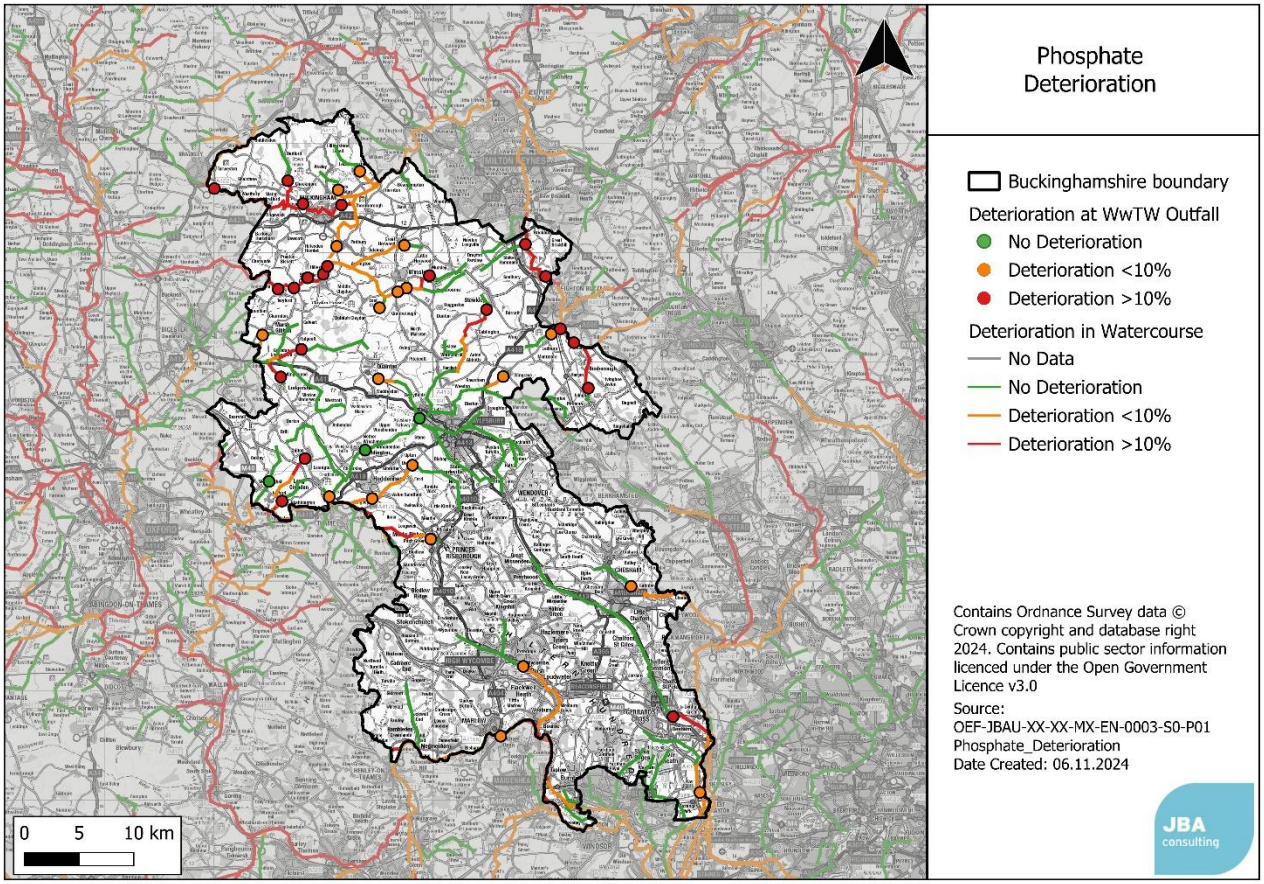


Figure 3-1 Phosphate deterioration for 31% growth scenarios

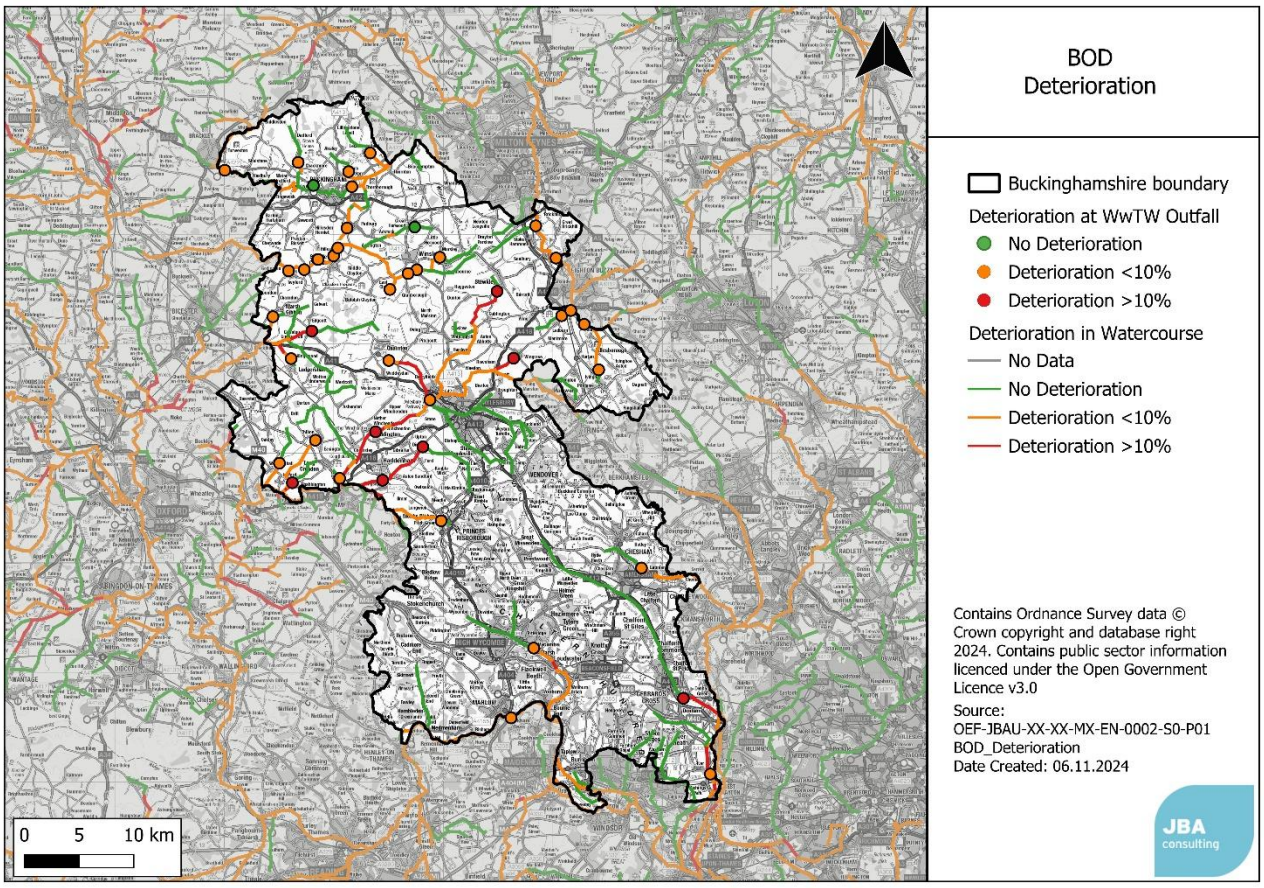


Figure 3-2 BOD deterioration for 31% growth scenario

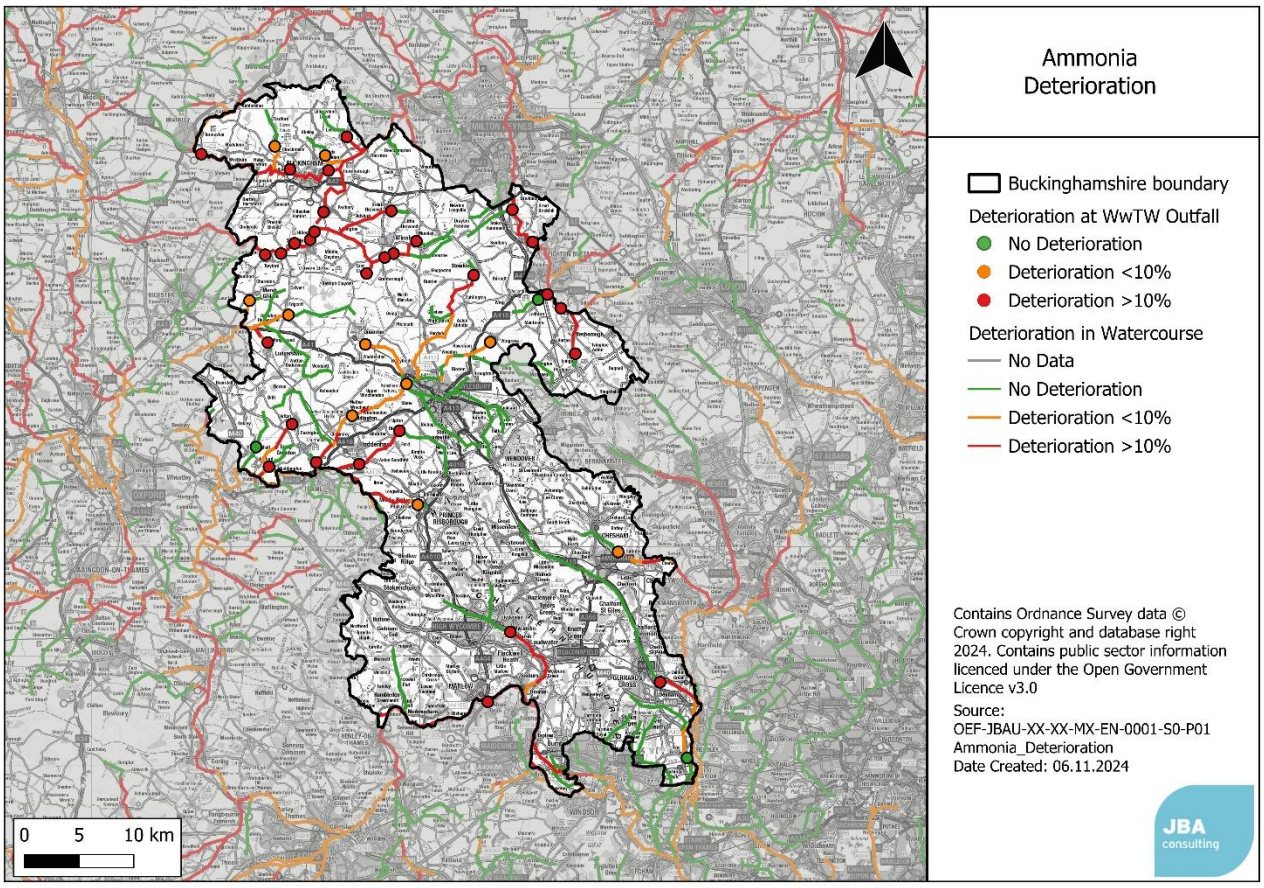


Figure 3-3 Ammonia deterioration for 31% growth scenario

A.2 WwTW deterioration table- Growth Scenario 27%

A.2.1 Ammonia

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
Aylesbury STW	0.5446	0.5705	5%	GOOD	GOOD
BRACKLEY STW (NEW)	0.2842	0.3341	18%	HIGH	GOOD
BUCKINGHAM(MAIDS MOR	0.398	0.4722	19%	GOOD	GOOD
CHACKMORE STW	0.0682	0.0813	19%	HIGH	HIGH
Chesham STW	0.7212	0.759	5%	MODERATE	MODERATE
Chilton STW	1.517	1.6989	12%	POOR	POOR
CUBLINGTON (WING) ST	0.2408	0.2704	12%	HIGH	HIGH
Cuddington STW	0.2608	0.2805	8%	HIGH	HIGH
DRAYTON PARSLOW STW	0.2109	0.2577	22%	HIGH	HIGH
FOXCOTE STW	0.0114	0.0123	8%	HIGH	HIGH
Gerrards Cross STW	0.2353	0.2704	15%	HIGH	HIGH
GREAT BRICKHILL STW	0.4151	0.4827	16%	GOOD	GOOD
GREAT HORWOOD	0.1755	0.2093	19%	HIGH	HIGH

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
Grendon Underwood STW	0.9217	0.9895	7%	MODERATE	MODERATE
Haddenham STW	0.3361	0.3767	12%	GOOD	GOOD
High Wycombe - transfer from Little Marlow	0.1316	0.1484	13%	HIGH	HIGH
HILLESDEN (HAMLET) STW	0.0262	0.0305	16%	HIGH	HIGH
Hillesden Church End	0.0266	0.0312	17%	HIGH	HIGH
HORTON STW	0.1439	0.1612	12%	HIGH	HIGH
Hurley STW	0.0901	0.1002	11%	HIGH	HIGH
Iver (North) STW	0.1273	0.1265	-1%	HIGH	HIGH
Ivinghoe Aston	0.4758	0.5564	17%	GOOD	GOOD
IVINGHOE STW	0.5143	0.5746	12%	GOOD	GOOD
LECKHAMSTEAD STW	0.0821	0.0941	15%	HIGH	HIGH
Ledburn	0.2693	0.2693	0%	HIGH	HIGH
Long Crendon STW	0.1657	0.1821	10%	HIGH	HIGH
Ludgershall STW	2.3659	2.5886	9%	POOR	BAD
Marsh Gibbon STW	2.6246	2.7004	3%	BAD	BAD
MIDDLE CLAYDON STW	0.0916	0.1124	23%	HIGH	HIGH

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
NORTH MARSTON STW	1.3899	1.7155	23%	POOR	POOR
OVING STW	0.1979	0.2422	22%	HIGH	HIGH
PADBURY STW	0.0865	0.1037	20%	HIGH	HIGH
POUNDON STW	0.0315	0.0374	18%	HIGH	HIGH
Princes Risborough STW	1.4891	1.6165	9%	POOR	POOR
Shabbington STW	0.9384	1.0997	17%	MODERATE	MODERATE
STEEPLE CLAYDON STW	0.1029	0.126	22%	HIGH	HIGH
Stewkley STW	0.7708	0.8895	15%	MODERATE	MODERATE
Stone STW	1.0166	1.2136	19%	MODERATE	POOR
STOWE STW	0.1429	0.1495	5%	HIGH	HIGH
SWANBOURNE STW	0.6526	0.7733	18%	MODERATE	MODERATE
TWYFORD STW	0.0322	0.0377	17%	HIGH	HIGH
Waddesdon STW	1.188	1.2276	3%	POOR	POOR
Wingrave STW	1.3319	1.4338	8%	POOR	POOR
WINSLOW STW	0.5792	0.6709	16%	GOOD	MODERATE
Worminghall STW	0.2267	0.2235	-1%	HIGH	HIGH

A.2.2 BOD

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
Aylesbury STW	2.3995	2.5345	6%	HIGH	HIGH
BRACKLEY STW (NEW)	2.3903	2.4374	2%	HIGH	HIGH
BUCKINGHAM(MAIDS MOR	2.2096	2.2865	3%	HIGH	HIGH
CHACKMORE STW	2.1592	2.1586	0%	HIGH	HIGH
Chesham STW	3.1457	3.2621	4%	HIGH	HIGH
Chilton STW	2.4051	2.5155	5%	HIGH	HIGH
CUBLINGTON (WING) ST	2.2884	2.2991	0%	HIGH	HIGH
Cuddington STW	1.3861	1.5188	10%	HIGH	HIGH
DRAYTON PARSLOW STW	1.2903	1.338	4%	HIGH	HIGH
FOXCOTE STW	3.7108	3.7111	0%	HIGH	HIGH
Gerrards Cross STW	2.3393	2.5934	11%	HIGH	HIGH
GREAT BRICKHILL STW	2.8664	2.967	4%	HIGH	HIGH
GREAT HORWOOD	3.7633	3.754	0%	HIGH	HIGH
Grendon Underwood STW	4.4025	4.9235	12%	GOOD	GOOD
Haddenham STW	1.9744	2.1923	11%	HIGH	HIGH

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
High Wycombe - transfer from Little Marlow	2.2642	2.4291	7%	HIGH	HIGH
HILLESDEN (HAMLET) STW	2.0414	2.0543	1%	HIGH	HIGH
Hillesden Church End	2.0443	2.0583	1%	HIGH	HIGH
HORTON STW	2.2971	2.2935	0%	HIGH	HIGH
Hurley STW	0.7561	0.792	5%	HIGH	HIGH
Iver (North) STW	1.4005	1.5163	8%	HIGH	HIGH
Ivinghoe Aston	2.5627	2.5856	1%	HIGH	HIGH
IVINGHOE STW	2.7051	2.7374	1%	HIGH	HIGH
LECKHAMSTEAD STW	3.851	3.8554	0%	HIGH	HIGH
Ledburn	3.2667	3.2691	0%	HIGH	HIGH
Long Crendon STW	1.1039	1.1795	7%	HIGH	HIGH
Ludgershall STW	4.5174	4.9413	9%	GOOD	GOOD
Marsh Gibbon STW	9.1935	9.5281	4%	BAD	BAD
MIDDLE CLAYDON STW	2.1153	2.1571	2%	HIGH	HIGH
NORTH MARSTON STW	3.9079	3.9409	1%	HIGH	HIGH
OVING STW	2.9985	3.0163	1%	HIGH	HIGH
PADBURY STW	2.8788	2.9091	1%	HIGH	HIGH

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
POUNDON STW	2.1602	2.1703	0%	HIGH	HIGH
Princes Risborough STW	6.2318	6.6447	7%	MODERATE	POOR
Shabbington STW	2.8298	3.1817	12%	HIGH	HIGH
STEEPLE CLAYDON STW	2.2	2.2432	2%	HIGH	HIGH
Stewkley STW	4.691	5.2706	12%	GOOD	MODERATE
Stone STW	3.4467	4.0222	17%	HIGH	GOOD
STOWE STW	3.321	3.3294	0%	HIGH	HIGH
SWANBOURNE STW	3.0116	3.0783	2%	HIGH	HIGH
TWYFORD STW	2.1044	2.1187	1%	HIGH	HIGH
Waddesdon STW	5.7343	6.1532	7%	MODERATE	MODERATE
Wingrave STW	4.8997	5.4324	11%	GOOD	MODERATE
WINSLOW STW	3.1171	3.2097	3%	HIGH	HIGH
Worminghall STW	2.4743	2.6546	7%	HIGH	HIGH

A.2.3 Phosphate

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
Aylesbury STW	0.25	0.2456	-2%	POOR	POOR
BRACKLEY STW (NEW)	0.2672	0.295	10%	POOR	POOR
BUCKINGHAM(MAIDS MOR	0.2026	0.2315	14%	MODERATE	MODERATE
CHACKMORE STW	0.1826	0.2056	13%	MODERATE	MODERATE
Chesham STW	0.2022	0.2107	4%	POOR	POOR
Chilton STW	2.4103	2.6465	10%	BAD	BAD
CUBLINGTON (WING) ST	0.4249	0.4666	10%	POOR	POOR
Cuddington STW	0.258	0.2565	-1%	POOR	POOR
DRAYTON PARSLOW STW	0.5324	0.5802	9%	POOR	POOR
FOXCOTE STW	0.0037	0.0038	5%	HIGH	HIGH
Gerrards Cross STW	0.3462	0.3919	13%	POOR	POOR
GREAT BRICKHILL STW	0.3104	0.3409	10%	POOR	POOR
GREAT HORWOOD	0.2316	0.2498	8%	MODERATE	MODERATE
Grendon Underwood STW	1.3885	1.5776	14%	BAD	BAD
Haddenham STW	1.4092	1.4887	6%	BAD	BAD

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
High Wycombe - transfer from Little Marlow	0.1494	0.1579	6%	MODERATE	MODERATE
HILLESDEN (HAMLET) STW	0.0912	0.1127	24%	GOOD	GOOD
Hillesden Church End	0.0912	0.1128	24%	GOOD	GOOD
HORTON STW	0.3634	0.3999	10%	POOR	POOR
Hurley STW	0.144	0.1565	9%	MODERATE	MODERATE
Iver (North) STW	0.2487	0.2669	7%	POOR	POOR
Ivinghoe Aston	0.2333	0.2616	12%	MODERATE	POOR
IVINGHOE STW	0.2475	0.2764	12%	MODERATE	POOR
LECKHAMSTEAD STW	0.1679	0.1709	2%	MODERATE	MODERATE
Ledburn	0.9404	0.9409	0%	POOR	POOR
Long Crendon STW	0.2497	0.2539	2%	POOR	POOR
Ludgershall STW	1.6864	1.8576	10%	BAD	BAD
Marsh Gibbon STW	0.8237	0.8254	0%	POOR	POOR
MIDDLE CLAYDON STW	0.5011	0.5644	13%	POOR	POOR
NORTH MARSTON STW	3.901	3.9107	0%	BAD	BAD
OVING STW	2.0873	2.1187	2%	BAD	BAD
PADBURY STW	1.1846	1.2357	4%	BAD	BAD

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
POUNDON STW	0.0923	0.1141	24%	GOOD	GOOD
Princes Risborough STW	0.4308	0.467	8%	POOR	POOR
Shabbington STW	1.3296	1.5387	16%	BAD	BAD
STEEPLE CLAYDON STW	0.3813	0.4498	18%	POOR	POOR
Stewkley STW	1.6183	1.7999	11%	BAD	BAD
Stone STW	1.5009	1.5906	6%	BAD	BAD
STOWE STW	0.2099	0.2516	20%	MODERATE	POOR
SWANBOURNE STW	0.7625	0.8697	14%	POOR	POOR
TWYFORD STW	0.1024	0.1268	24%	GOOD	MODERATE
Waddesdon STW	0.3955	0.406	3%	POOR	POOR
Wingrave STW	0.3804	0.3971	4%	POOR	POOR
WINSLOW STW	2.385	2.472	4%	BAD	BAD
Worminghall STW	1.2037	1.1287	-6%	BAD	BAD

A.3 WwTW deterioration table- Growth Scenario 31%

A.3.1 Ammonia

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
Aylesbury STW	0.5446	0.5751	6%	GOOD	GOOD
BRACKLEY STW (NEW)	0.2842	0.3409	20%	HIGH	GOOD
BUCKINGHAM(MAIDS MOR	0.398	0.482	21%	GOOD	GOOD
CHACKMORE STW	0.0682	0.0832	22%	HIGH	HIGH
Chesham STW	0.7212	0.764	6%	MODERATE	MODERATE
Chilton STW	1.517	1.7049	12%	POOR	POOR
CUBLINGTON (WING) ST	0.2408	0.2747	14%	HIGH	HIGH
Cuddington STW	0.2608	0.2836	9%	HIGH	HIGH
DRAYTON PARSLOW STW	0.2109	0.2646	25%	HIGH	HIGH
FOXCOTE STW	0.0114	0.0125	9%	HIGH	HIGH
Gerrards Cross STW	0.2353	0.2765	17%	HIGH	HIGH
GREAT BRICKHILL STW	0.4151	0.4877	17%	GOOD	GOOD
GREAT HORWOOD	0.1755	0.2146	22%	HIGH	HIGH
Grendon Underwood STW	0.9217	0.9934	8%	MODERATE	MODERATE

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
Haddenham STW	0.3361	0.3827	14%	GOOD	GOOD
High Wycombe - transfer from Little Marlow	0.1316	0.1507	15%	HIGH	HIGH
HILLESDEN (HAMLET) STW	0.0262	0.0313	19%	HIGH	HIGH
Hillesden Church End	0.0266	0.0319	20%	HIGH	HIGH
HORTON STW	0.1439	0.1634	14%	HIGH	HIGH
Hurley STW	0.0901	0.102	13%	HIGH	HIGH
Iver (North) STW	0.1273	0.1258	-1%	HIGH	HIGH
Ivinghoe Aston	0.4758	0.5672	19%	GOOD	GOOD
IVINGHOE STW	0.5143	0.5822	13%	GOOD	GOOD
LECKHAMSTEAD STW	0.0821	0.0975	19%	HIGH	HIGH
Ledburn	0.2693	0.2693	0%	HIGH	HIGH
Long Crendon STW	0.1657	0.1842	11%	HIGH	HIGH
Ludgershall STW	2.3659	2.6036	10%	POOR	BAD
Marsh Gibbon STW	2.6246	2.7096	3%	BAD	BAD
MIDDLE CLAYDON STW	0.0916	0.1154	26%	HIGH	HIGH
NORTH MARSTON STW	1.3899	1.7646	27%	POOR	POOR
OVING STW	0.1979	0.249	26%	HIGH	HIGH

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
PADBURY STW	0.0865	0.1064	23%	HIGH	HIGH
POUNDON STW	0.0315	0.0382	21%	HIGH	HIGH
Princes Risborough STW	1.4891	1.6281	9%	POOR	POOR
Shabbington STW	0.9384	1.107	18%	MODERATE	POOR
STEEPLE CLAYDON STW	0.1029	0.1293	26%	HIGH	HIGH
Stewkley STW	0.7708	0.8996	17%	MODERATE	MODERATE
Stone STW	1.0166	1.2373	22%	MODERATE	POOR
STOWE STW	0.1429	0.1496	5%	HIGH	HIGH
SWANBOURNE STW	0.6526	0.7929	21%	MODERATE	MODERATE
TWYFORD STW	0.0322	0.0384	19%	HIGH	HIGH
Waddesdon STW	1.188	1.2407	4%	POOR	POOR
Wingrave STW	1.3319	1.4463	9%	POOR	POOR
WINSLOW STW	0.5792	0.6858	18%	GOOD	MODERATE
Worminghall STW	0.2267	0.2232	-2%	HIGH	HIGH

A.3.2 BOD

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
Aylesbury STW	2.3995	2.5609	7%	HIGH	HIGH
BRACKLEY STW (NEW)	2.3903	2.4386	2%	HIGH	HIGH
BUCKINGHAM(MAIDS MOR	2.2096	2.2856	3%	HIGH	HIGH
CHACKMORE STW	2.1592	2.1585	0%	HIGH	HIGH
Chesham STW	3.1457	3.2737	4%	HIGH	HIGH
Chilton STW	2.4051	2.5385	6%	HIGH	HIGH
CUBLINGTON (WING) ST	2.2884	2.3024	1%	HIGH	HIGH
Cuddington STW	1.3861	1.5403	11%	HIGH	HIGH
DRAYTON PARSLOW STW	1.2903	1.3504	5%	HIGH	HIGH
FOXCOTE STW	3.7108	3.7111	0%	HIGH	HIGH
Gerrards Cross STW	2.3393	2.6157	12%	HIGH	HIGH
GREAT BRICKHILL STW	2.8664	2.9651	3%	HIGH	HIGH
GREAT HORWOOD	3.7633	3.7526	0%	HIGH	HIGH
Grendon Underwood STW	4.4025	5.0078	14%	GOOD	MODERATE
Haddenham STW	1.9744	2.226	13%	HIGH	HIGH

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
High Wycombe - transfer from Little Marlow	2.2642	2.4555	8%	HIGH	HIGH
HILLESDEN (HAMLET) STW	2.0414	2.0562	1%	HIGH	HIGH
Hillesden Church End	2.0443	2.0603	1%	HIGH	HIGH
HORTON STW	2.2971	2.3033	0%	HIGH	HIGH
Hurley STW	0.7561	0.7966	5%	HIGH	HIGH
Iver (North) STW	1.4005	1.5361	10%	HIGH	HIGH
Ivinghoe Aston	2.5627	2.5935	1%	HIGH	HIGH
IVINGHOE STW	2.7051	2.7306	1%	HIGH	HIGH
LECKHAMSTEAD STW	3.851	3.856	0%	HIGH	HIGH
Ledburn	3.2667	3.2695	0%	HIGH	HIGH
Long Crendon STW	1.1039	1.1945	8%	HIGH	HIGH
Ludgershall STW	4.5174	4.9556	10%	GOOD	GOOD
Marsh Gibbon STW	9.1935	9.5558	4%	BAD	BAD
MIDDLE CLAYDON STW	2.1153	2.1586	2%	HIGH	HIGH
NORTH MARSTON STW	3.9079	3.9463	1%	HIGH	HIGH
OVING STW	2.9985	3.0192	1%	HIGH	HIGH
PADBURY STW	2.8788	2.9109	1%	HIGH	HIGH

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
POUNDON STW	2.1602	2.1711	1%	HIGH	HIGH
Princes Risborough STW	6.2318	6.6829	7%	MODERATE	POOR
Shabbington STW	2.8298	3.2091	13%	HIGH	HIGH
STEEPLE CLAYDON STW	2.2	2.29	4%	HIGH	HIGH
Stewkley STW	4.691	5.3448	14%	GOOD	MODERATE
Stone STW	3.4467	4.0972	19%	HIGH	GOOD
STOWE STW	3.321	3.3306	0%	HIGH	HIGH
SWANBOURNE STW	3.0116	3.1284	4%	HIGH	HIGH
TWYFORD STW	2.1044	2.1208	1%	HIGH	HIGH
Waddesdon STW	5.7343	6.2546	9%	MODERATE	MODERATE
Wingrave STW	4.8997	5.5025	12%	GOOD	MODERATE
WINSLOW STW	3.1171	3.2337	4%	HIGH	HIGH
Worminghall STW	2.4743	2.6943	9%	HIGH	HIGH

A.3.3 Phosphate

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
Aylesbury STW	0.25	0.2451	-2%	POOR	POOR
BRACKLEY STW (NEW)	0.2672	0.3	12%	POOR	POOR
BUCKINGHAM(MAIDS MOR	0.2026	0.24	16%	MODERATE	MODERATE
CHACKMORE STW	0.1826	0.21	14%	MODERATE	MODERATE
Chesham STW	0.2022	0.2117	5%	POOR	POOR
Chilton STW	2.4103	2.6799	11%	BAD	BAD
CUBLINGTON (WING) ST	0.4249	0.47	11%	POOR	POOR
Cuddington STW	0.258	0.2564	-1%	POOR	POOR
DRAYTON PARSLOW STW	0.5324	0.59	10%	POOR	POOR
FOXCOTE STW	0.0037	0	8%	MODERATE	MODERATE
Gerrards Cross STW	0.3462	0.3982	15%	POOR	POOR
GREAT BRICKHILL STW	0.3104	0.34	11%	POOR	POOR
GREAT HORWOOD	0.2316	0.25	9%	MODERATE	POOR
Grendon Underwood STW	1.3885	1.6033	15%	BAD	BAD
Haddenham STW	1.4092	1.5	6%	BAD	BAD

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
High Wycombe - transfer from Little Marlow	0.1494	0.159	6%	MODERATE	MODERATE
HILLESDEN (HAMLET) STW	0.0912	0.12	27%	MODERATE	MODERATE
Hillesden Church End	0.0912	0.12	27%	MODERATE	MODERATE
HORTON STW	0.3634	0.4	11%	POOR	POOR
Hurley STW	0.144	0.1583	10%	MODERATE	MODERATE
Iver (North) STW	0.2487	0.2692	8%	POOR	POOR
Ivinghoe Aston	0.2333	0.27	14%	MODERATE	POOR
IVINGHOE STW	0.2475	0.28	13%	MODERATE	POOR
LECKHAMSTEAD STW	0.1679	0.17	2%	MODERATE	MODERATE
Ledburn	0.9404	0.94	0%	POOR	POOR
Long Crendon STW	0.2497	0.2545	2%	POOR	POOR
Ludgershall STW	1.6864	1.88	11%	BAD	BAD
Marsh Gibbon STW	0.8237	0.8258	0%	POOR	POOR
MIDDLE CLAYDON STW	0.5011	0.57	14%	POOR	POOR
NORTH MARSTON STW	3.901	3.91	0%	BAD	BAD
OVING STW	2.0873	2.12	2%	BAD	BAD
PADBURY STW	1.1846	1.24	5%	BAD	BAD

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
POUNDON STW	0.0923	0.12	27%	MODERATE	MODERATE
Princes Risborough STW	0.4308	0.4716	9%	POOR	POOR
Shabbington STW	1.3296	1.5674	18%	BAD	BAD
STEEPLE CLAYDON STW	0.3813	0.46	21%	POOR	POOR
Stewkley STW	1.6183	1.8248	13%	BAD	BAD
Stone STW	1.5009	1.6036	7%	BAD	BAD
STOWE STW	0.2099	0.26	23%	MODERATE	POOR
SWANBOURNE STW	0.7625	0.89	16%	POOR	POOR
TWYFORD STW	0.1024	0.13	27%	MODERATE	MODERATE
Waddesdon STW	0.3955	0.4075	3%	POOR	POOR
Wingrave STW	0.3804	0.3995	5%	POOR	POOR
WINSLOW STW	2.385	2.48	4%	BAD	BAD
Worminghall STW	1.2037	1.1195	-7%	BAD	BAD

A.4 WwTW deterioration table- Growth Scenario 36%

A.4.1 Ammonia

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
Aylesbury STW	0.5446	0.5814	7%	GOOD	GOOD
BRACKLEY STW (NEW)	0.2842	0.3493	23%	HIGH	GOOD
BUCKINGHAM(MAIDS MOR	0.398	0.4941	24%	GOOD	GOOD
CHACKMORE STW	0.0682	0.0854	25%	HIGH	HIGH
Chesham STW	0.7212	0.7698	7%	MODERATE	MODERATE
Chilton STW	1.517	1.7285	14%	POOR	POOR
CUBLINGTON (WING) ST	0.2408	0.279	16%	HIGH	HIGH
Cuddington STW	0.2608	0.2868	10%	HIGH	HIGH
DRAYTON PARSLOW STW	0.2109	0.2734	30%	HIGH	HIGH
FOXCOTE STW	0.0114	0.0125	9%	HIGH	HIGH
Gerrards Cross STW	0.2353	0.284	21%	HIGH	HIGH
GREAT BRICKHILL STW	0.4151	0.4916	18%	GOOD	GOOD
GREAT HORWOOD	0.1755	0.2212	26%	HIGH	HIGH
Grendon Underwood STW	0.9217	1.0122	10%	MODERATE	MODERATE

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
Haddenham STW	0.3361	0.3887	16%	GOOD	GOOD
High Wycombe - transfer from Little Marlow	0.1316	0.1532	16%	HIGH	HIGH
HILLESDEN (HAMLET) STW	0.0262	0.0319	21%	HIGH	HIGH
Hillesden Church End	0.0266	0.0327	23%	HIGH	HIGH
HORTON STW	0.1439	0.1663	16%	HIGH	HIGH
Hurley STW	0.0901	0.104	15%	HIGH	HIGH
Iver (North) STW	0.1273	0.1249	-2%	HIGH	HIGH
Ivinghoe Aston	0.4758	0.5781	21%	GOOD	GOOD
IVINGHOE STW	0.5143	0.5913	15%	GOOD	GOOD
LECKHAMSTEAD STW	0.0821	0.1	22%	HIGH	HIGH
Ledburn	0.2693	0.2693	0%	HIGH	HIGH
Long Crendon STW	0.1657	0.1855	12%	HIGH	HIGH
Ludgershall STW	2.3659	2.6438	12%	POOR	BAD
Marsh Gibbon STW	2.6246	2.7235	4%	BAD	BAD
MIDDLE CLAYDON STW	0.0916	0.1192	30%	HIGH	HIGH
NORTH MARSTON STW	1.3899	1.8255	31%	POOR	POOR
OVING STW	0.1979	0.2517	27%	HIGH	HIGH

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
PADBURY STW	0.0865	0.1099	27%	HIGH	HIGH
POUNDON STW	0.0315	0.0394	25%	HIGH	HIGH
Princes Risborough STW	1.4891	1.6498	11%	POOR	POOR
Shabbington STW	0.9384	1.1244	20%	MODERATE	POOR
STEEPLE CLAYDON STW	0.1029	0.1335	30%	HIGH	HIGH
Stewkley STW	0.7708	0.9133	18%	MODERATE	MODERATE
Stone STW	1.0166	1.2661	25%	MODERATE	POOR
STOWE STW	0.1429	0.1498	5%	HIGH	HIGH
SWANBOURNE STW	0.6526	0.8174	25%	MODERATE	MODERATE
TWYFORD STW	0.0322	0.0395	23%	HIGH	HIGH
Waddesdon STW	1.188	1.2566	6%	POOR	POOR
Wingrave STW	1.3319	1.4679	10%	POOR	POOR
WINSLOW STW	0.5792	0.704	22%	GOOD	MODERATE
Worminghall STW	0.2267	0.2228	-2%	HIGH	HIGH

A.4.2 BOD

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
Aylesbury STW	2.3995	2.5855	8%	HIGH	HIGH
BRACKLEY STW (NEW)	2.3903	2.4401	2%	HIGH	HIGH
BUCKINGHAM(MAIDS MOR	2.2096	2.2975	4%	HIGH	HIGH
CHACKMORE STW	2.1592	2.1584	0%	HIGH	HIGH
Chesham STW	3.1457	3.2922	5%	HIGH	HIGH
Chilton STW	2.4051	2.569	7%	HIGH	HIGH
CUBLINGTON (WING) ST	2.2884	2.3042	1%	HIGH	HIGH
Cuddington STW	1.3861	1.5649	13%	HIGH	HIGH
DRAYTON PARSLOW STW	1.2903	1.3637	6%	HIGH	HIGH
FOXCOTE STW	3.7108	3.7111	0%	HIGH	HIGH
Gerrards Cross STW	2.3393	2.6657	14%	HIGH	HIGH
GREAT BRICKHILL STW	2.8664	2.9627	3%	HIGH	HIGH
GREAT HORWOOD	3.7633	3.7509	0%	HIGH	HIGH
Grendon Underwood STW	4.4025	5.1371	17%	GOOD	MODERATE
Haddenham STW	1.9744	2.2552	14%	HIGH	HIGH

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
High Wycombe - transfer from Little Marlow	2.2642	2.4872	10%	HIGH	HIGH
HILLESDEN (HAMLET) STW	2.0414	2.0593	1%	HIGH	HIGH
Hillesden Church End	2.0443	2.0629	1%	HIGH	HIGH
HORTON STW	2.2971	2.3051	0%	HIGH	HIGH
Hurley STW	0.7561	0.8034	6%	HIGH	HIGH
Iver (North) STW	1.4005	1.5588	11%	HIGH	HIGH
Ivinghoe Aston	2.5627	2.5887	1%	HIGH	HIGH
IVINGHOE STW	2.7051	2.7402	1%	HIGH	HIGH
LECKHAMSTEAD STW	3.851	3.8568	0%	HIGH	HIGH
Ledburn	3.2667	3.2699	0%	HIGH	HIGH
Long Crendon STW	1.1039	1.2083	9%	HIGH	HIGH
Ludgershall STW	4.5174	5.024	11%	GOOD	MODERATE
Marsh Gibbon STW	9.1935	9.5884	4%	BAD	BAD
MIDDLE CLAYDON STW	2.1153	2.1686	3%	HIGH	HIGH
NORTH MARSTON STW	3.9079	3.9472	1%	HIGH	HIGH
OVING STW	2.9985	3.0226	1%	HIGH	HIGH
PADBURY STW	2.8788	2.9131	1%	HIGH	HIGH

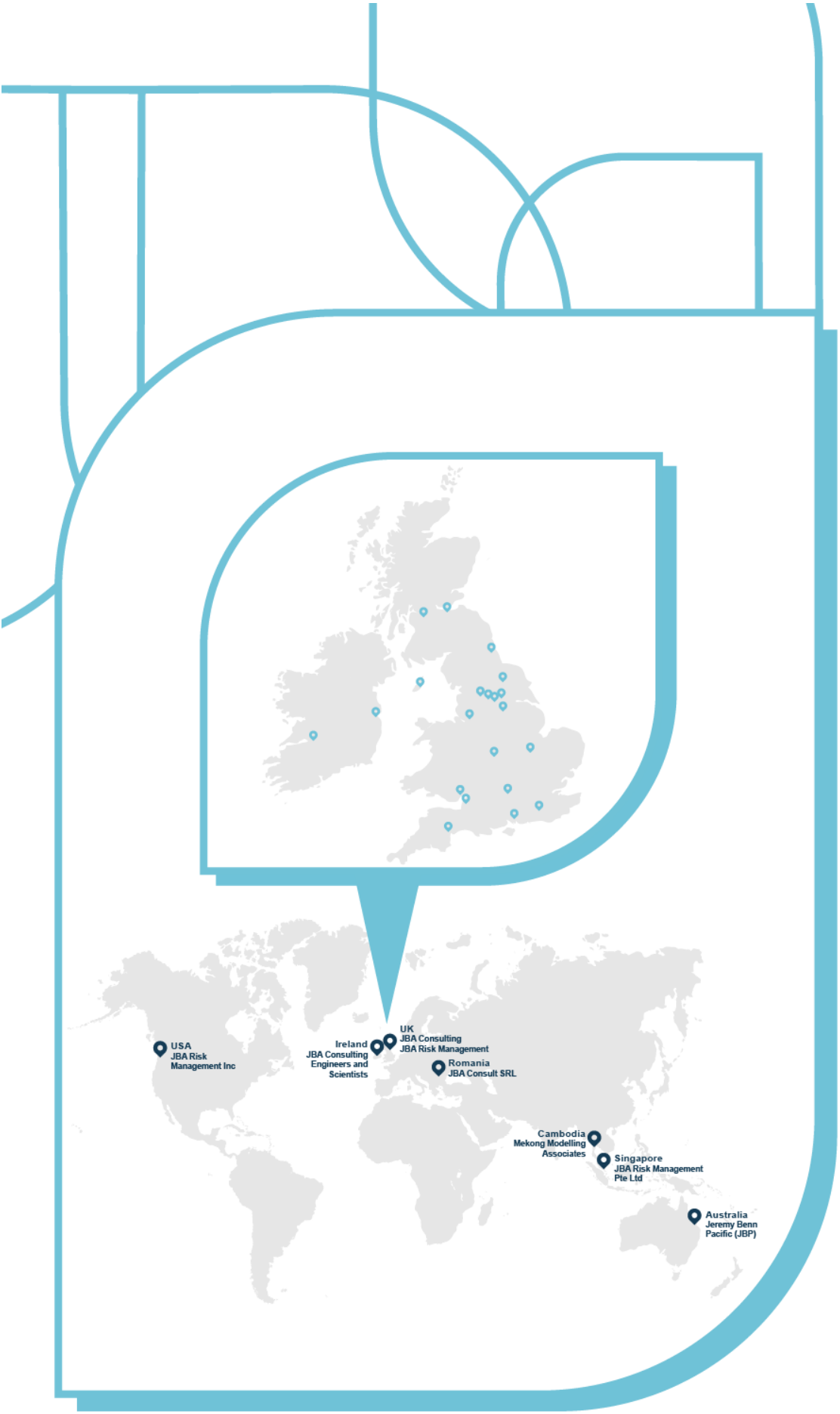
WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
POUNDON STW	2.1602	2.1721	1%	HIGH	HIGH
Princes Risborough STW	6.2318	6.7438	8%	MODERATE	POOR
Shabbington STW	2.8298	3.2755	16%	HIGH	HIGH
STEEPLE CLAYDON STW	2.2	2.3067	5%	HIGH	HIGH
Stewkley STW	4.691	5.4345	16%	GOOD	MODERATE
Stone STW	3.4467	4.1884	22%	HIGH	GOOD
STOWE STW	3.321	3.3321	0%	HIGH	HIGH
SWANBOURNE STW	3.0116	3.1758	5%	HIGH	HIGH
TWYFORD STW	2.1044	2.1234	1%	HIGH	HIGH
Waddesdon STW	5.7343	6.3158	10%	MODERATE	MODERATE
Wingrave STW	4.8997	5.5842	14%	GOOD	MODERATE
WINSLOW STW	3.1171	3.2588	5%	HIGH	HIGH
Worminghall STW	2.4743	2.7244	10%	HIGH	HIGH

A.4.3 Phosphate

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
Aylesbury STW	0.25	0.25	-2%	POOR	POOR
BRACKLEY STW (NEW)	0.2672	0.3037	14%	POOR	POOR
BUCKINGHAM(MAIDS MOR	0.2026	0.2406	19%	MODERATE	MODERATE
CHACKMORE STW	0.1826	0.213	17%	MODERATE	MODERATE
Chesham STW	0.2022	0.21	5%	POOR	POOR
Chilton STW	2.4103	2.72	13%	BAD	BAD
CUBLINGTON (WING) ST	0.4249	0.4787	13%	POOR	POOR
Cuddington STW	0.258	0.26	-1%	POOR	POOR
DRAYTON PARSLOW STW	0.5324	0.5961	12%	POOR	POOR
FOXCOTE STW	0.0037	0.004	8%	HIGH	HIGH
Gerrards Cross STW	0.3462	0.41	17%	POOR	POOR
GREAT BRICKHILL STW	0.3104	0.35	13%	POOR	POOR
GREAT HORWOOD	0.2316	0.2556	10%	MODERATE	POOR
Grendon Underwood STW	1.3885	1.63	17%	BAD	BAD
Haddenham STW	1.4092	1.51	7%	BAD	BAD

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
High Wycombe - transfer from Little Marlow	0.1494	0.16	7%	MODERATE	MODERATE
HILLESDEN (HAMLET) STW	0.0912	0.1199	32%	GOOD	GOOD
Hillesden Church End	0.0912	0.12	32%	GOOD	MODERATE
HORTON STW	0.3634	0.4105	13%	POOR	POOR
Hurley STW	0.144	0.16	11%	MODERATE	MODERATE
Iver (North) STW	0.2487	0.27	9%	POOR	POOR
Ivinghoe Aston	0.2333	0.2701	16%	MODERATE	POOR
IVINGHOE STW	0.2475	0.285	15%	MODERATE	POOR
LECKHAMSTEAD STW	0.1679	0.1719	2%	MODERATE	MODERATE
Ledburn	0.9404	0.941	0%	POOR	POOR
Long Crendon STW	0.2497	0.26	2%	POOR	POOR
Ludgershall STW	1.6864	1.91	13%	BAD	BAD
Marsh Gibbon STW	0.8237	0.83	0%	POOR	POOR
MIDDLE CLAYDON STW	0.5011	0.5851	17%	POOR	POOR
NORTH MARSTON STW	3.901	3.9148	0%	BAD	BAD
OVING STW	2.0873	2.1291	2%	BAD	BAD
PADBURY STW	1.1846	1.2523	6%	BAD	BAD

WwTW (SIMCAT name)	Baseline concentration (mg/l)	Future concentration (mg/l)	Percentage deterioration (%)	Baseline Class	Future Class
POUNDON STW	0.0923	0.1213	31%	GOOD	MODERATE
Princes Risborough STW	0.4308	0.48	11%	POOR	POOR
Shabbington STW	1.3296	1.6	20%	BAD	BAD
STEEPLE CLAYDON STW	0.3813	0.4722	24%	POOR	POOR
Stewkley STW	1.6183	1.86	15%	BAD	BAD
Stone STW	1.5009	1.62	8%	BAD	BAD
STOWE STW	0.2099	0.2654	26%	MODERATE	POOR
SWANBOURNE STW	0.7625	0.9043	19%	POOR	POOR
TWYFORD STW	0.1024	0.1349	32%	GOOD	MODERATE
Waddesdon STW	0.3955	0.41	3%	POOR	POOR
Wingrave STW	0.3804	0.4	6%	POOR	POOR
WINSLOW STW	2.385	2.5001	5%	BAD	BAD
Worminghall STW	1.2037	1.11	-8%	BAD	BAD



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